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he expressed his belief that the species was still to be determined.

The author concluded by stating his belief in the existence of a fourth seal (probably P. Barbata) on the southern coasts of Ireland, which he had occasionally seen, but never had opportunity of closely inspecting; and finally exhibited a number of sketches illustrative of his paper, showing generic and specific distinctions of external forms, skulls, teeth, cæca, and of the great sinuses of the hepatic veins.

Professor Kane laid before the Academy, specimens of the salts of a new acid, called by him "Xanthomethilic Acid."

The same gentleman stated some conclusions to which he had recently arrived, from the examination of pyroacetic spirit, which he considered to be a new alcohol.

DONATIONS.

Discours sur quelques Progrès des Sciences Mathematiques en France, depuis 1830. Par le Baron Charles Dupin, President de l'Académie. Presented by the Author.

Researches on Heat. (Second Series.) By James D. Forbes, Esq. F.R.SS.L.& E., F.G.S. Presented by the Author.

January 9, 1837.

Rev. B. LLOYD, D. D., Provost, T. C. D., President, in the Chair.

Matthew Barrington. Esq., Arthur E. Gayer, Esq., Sir John Kingston James, Bart., Francis Barker, M. D., William Gregory M. D., F. R. S. E., Edward A. Clarke, Esq., Charles Lambert, Esq., and Thomas Williams, Esq., were elected Members of the Academy.

The Secretary read a letter from the Secretary of the Royal Academy of Madrid, returning thanks for a copy of the Transactions.

Sir William Betham read a letter from the Baron de Donop, of Saxe Meiningen, on the subject of the alleged discovery of the MS. Translation of Sanconiathon's History of the Phœnicians, by Philo Biblius.*

Sir William Betham read a letter from Sir John Tobin of Liverpool, respecting the cast-iron ring money, found on board the wreck of a vessel, and exhibited at the meeting of the Academy in November:—the following is an extract.

"On the subject of the schooner, Magnificent, which was lost somewhere near Cork, some time since:—she was bound to the river Bonney, or New Calabar, which is not far from the kingdom of Benin. The trade to these rivers for palm oil and ivory, is cotton goods, gunpowder, muskets, and a great variety of other articles;—and among them *manillas*, both of iron and a mixed metal of copper and brass, which is the money that the people of Eboe and Brass Country, and all the nations in that neighbourhood, go to market with. On Wednesday next I will send you a manilla of each kind."

Sir John Tobin states the price of the copper manillas to be £105 per ton, and that of the cast iron £22; the former passes, therefore, for about five of the latter. They so perfectly resemble the Irish antique, as to be scarcely distinguishable except by the difference of the material.

Sir William Betham also read a letter from Captain Edward Jones to Samuel Hibbert, M.D., which the latter gentleman transmitted to him, with the sketches there alluded to.

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* An extract from this letter will be given in the next number of the Proceedings.

"The annexed two sketches are taken from a cast of the species of money now at the present day passing current among the Africans. It so strongly resembles what we saw in Ireland, that I thought you might be interested in a copy of it. Mr. Dyson, who was for some years a surgeon on board an African merchantman, brought it with him; and the first opportunity, I shall make inquiries respecting this and other coin used among the natives. I am told that in the country they are made of solid gold, as in Ireland."

Sir William Betham also read an extract from a letter from Mr. Bonomi to T. C. Croker, Esq.

"You ask me for a note on the ring money of Africa; here it is. So little has the interior of the country changed in that particular since the days of the Pharaohs, that to this day, among the inhabitants of Sennaar, pieces of gold in the form of a ring pass current as money. The rings have a cut in them for the convenience of keeping them together; the gold being so pure you easily bend them, and unite them in the manner of a chain. This money is weighed as in the days of Joseph."

These gold rings are so similar in shape to the ancient rings found in Ireland, that the sketch of one accurately represents the other.

It is a remarkable fact that the name *manilla*, which these brass and iron articles still bear in Africa, signifies *money* in the Celto-Phœnician Irish. *Main* is 'value,' 'worth,' and *aillech* is 'cattle,' 'household stuff,' or 'any kind of property.' So that in this respect the derivation is similar to that of *pecunia* from *pecus*. The manillas were, no doubt, introduced into Africa by the same people that brought them to Ireland; and as the Negro nations have changed but little, if at all, they still pass as money by their old Phœnician name.

The Rev. James H. Todd, A. M., M. R. I. A., Fellow of Trinity College, gave an account of a discovery made by Mr. John O'Donovan, of a valuable though imperfect copy, in MS., of the Annals of Kilronan, or Book of the O'Duigenans, a work that had hitherto been supposed to be lost.

This MS. was discovered by Mr. O'Donovan while engaged in preparing a catalogue of the Irish MSS. preserved in the University Library.

The volume is in quarto and, in its original state, consisted entirely of parchment. It is now imperfect both at the beginning and at the end, and has also some intermediate chasms. The first and earliest portion appears to have been transcribed by one Philip Badley, who states himself to have been engaged in the task in the year 1580; but two or three other hands, evidently of the same period, may be observed throughout the volume, as if two or more scribes had been simultaneously engaged in its transcription.

The Chronicle in its present state begins with the year 1014 and ends with 1571. The principal chasms are between the years 1138 and 1170, and also between the years 1316 and 1462. In the former of these chasms, several leaves of paper have been inserted which are entirely blank. The latter has also been filled with paper, on which some very brief entries have been made relating to the years between 1412 and 1462. Many of these entries, however, record merely the date, with the lunar and solar cycles, indiction, and Julian period corresponding. Two copies of this paper portion of the volume are preserved, one of them of a date perhaps a century later than the other. The older appears to have been written in the sixteenth, or early in the seventeenth, century.

Throughout the book several marginal notes occur, which are for the most part summaries of the text, both in Irish and English. The greater part of the English notes are in the hand-writing of Roderick O'Flaherty, the celebrated author of Ogygia. This fact was ascertained by comparing these entries with the known autograph of O'Flaherty. The volume, therefore, was formerly in the possession of that eminent antiquary.

The book is lettered on the back *Tigernachi continuator;* and has hence been erroneously supposed to be the continuation of Tigernach's Annals, drawn up by Augustin Mac Raith, (Magrath), called by Colgan and others *Mac Raidinus,* a canon of the Augustinian monastery of All Saints in Lough Righ, in the River Shannon, who died A. D. 1405. And as this chronicle extends to the year 1571, Mr. O'Reilly supposed it to include a continuation of Magrath's work.* This error, which the slightest inspection of its contents refutes, was afterwards pointed out by Mr. O'Reilly himself;† and the comparison of the book with a complete copy of the continuation of Tigernach in the University Library, sets the question entirely at rest.

Mr. O'Reilly having satisfied himself that this chronicle was not what it had hitherto been taken for, declares himself unable to say what it should be called; but Mr. O'Donovan has now proved it to be the ANNALS OF KILRONAN, or BOOK OF THE O'DUIGENANS, mentioned by the Four Masters as one of the original sources from which they derived the materials of their celebrated work.

Mr. Todd then stated that extracts from what is called the *Book of Kilronan,* in the hand-writing of Charles O'Conor of Belanagare, are preserved in the Stowe Library; and that a quotation from these extracts given by Dr. O'Conor in his catalogue of the Stowe MSS., was not to be found in the Dublin MS. of the Kilronan Annals. This fact appeared at first sight to create a formidable difficulty in the way of

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* Transactions of the Hiberno-Celtic Society, in ann. 1405, p. cxiii.

† See Mr. Mason's Catalogue of the Irish MSS. in Trinity College.

Mr. O'Donovan's opinion. The consideration of it, however, led Mr. Todd to conjecture, that the *Book* of Kilronan, from which Charles O'Conor made the extracts in question, could not be the *Annals* of Kilronan, which were in the hands of the Four Masters. Mr. O'Conor describes it as the book of *the church* of Kilronan, and from the extracts he has made from it, it appears to have begun at least with the times of St. Patrick, whereas the Annals of Kilronan, as described by the Four Masters, began with the year 900, and are expressly called by them the *Book of the O'Duigenans*. The one, therefore, was *a church book*, or chronicle kept by the ecclesiastics connected with the church of Kilronan, whereas the other was the family chronicle of the Mac Dermots, compiled by their family bards, the O'Duigenans, of Kilronan. This conclusion is interesting, as acquainting us with the fact, that the *Book of the Church of Kilronan* existed so lately as the year 1728, when O'Conor made the extract from it, which is now in the Stowe Library, and that it may perhaps exist to this day unknown, or under some other name.

The discovery of the Book of the O'Duigenans, or Annals of Kilronan, will be of great importance, if ever the liberality of government, or the contributions of individuals, should supply the means of printing the ancient historical records of this country. To a complete edition of the Annals of the Four Masters, it is essential that as many as possible of the original documents from which they drew their materials should be in our hands. And this discovery supplies us with one of these documents, whose existence was hitherto unknown to Irish antiquarians. Of the ancient annalists, whose works formed the basis of the Annals of the Four Masters, there are now not more than two or three that are not to be found in the Library of the Academy, or in that of Trinity College.

Mr. Petrie exhibited a MS. of the four Gospels, in Latin, of which he had given an account in a paper read some time since before the Academy. This manuscript is said to have been that given by St. Patrick to the first Bishop of Clogher. It is enclosed in a brazen case, of very curious workmanship, on which the circumstances connected with the gift are represented in highly raised figures.

Professor Lloyd communicated to the Academy the continuation of his investigations "On the Propagation of Light in uncrystallized Media."

In the first part of this paper, read on a former evening, the author had expressed his conviction that the problem of wave-propagation in bodies was incompletely solved, unless the action of the material molecules be taken into account. This he has attempted to do in the present continuation, confining himself to the comparatively simple case in which the molecules of the ether and of the body are uniformly diffused.

The differential equations of motion inferred from these considerations contain, each, the displacements of the molecules of the ether and of the body,—with coefficients depending on the masses and distances of the molecules, the law of force to which they are subjected, and the length of the wave. By a particular method of elimination, these pairs of *simultaneous* equations may be reduced each to a single one, of the simple form which occurs in the case of a single vibrating medium, the new coefficient being connected with those of the original equations by an equation of the second degree. The expression for the displacement, then, is of the same form as in the case of a single vibrating medium; but the relation between the coefficients of the time and of the distance, and consequently the velocity of propagation, will be very different.

The quadratic equation above alluded to expresses the relation of these coefficients, or, in other words, the relation between the period of vibration and the length of the wave. When the action of the molecules of the ether and of the body, *inter se*, and on one another, is governed by the same law, this equation is resolvable into simple factors, one of which only seems to belong to the problem, the other giving an expression for the velocity of propagation independent of the length of the wave. The author accordingly proceeds to develop the former of these formulæ, converting the triple sums which it contains into triple integrals, according to the method of M. Cauchy.

Among the consequences deducible from this development is the following:—In the expanded expression for the velocity of propagation, each term consists of two parts, one of which is due to the action of the ether, and the other to that of the body. It is not improbable that there may be bodies for which the first or principal term is nearly nothing, the two parts of which it is composed being of opposite signs, and nearly equal. In this case the principal part of the expression for the velocity will be that derived from the second term; and, if that term be taken as an approximate value, it will follow that the refractive index of the substance must be in the sub-duplicate ratio of the length of the wave, nearly. Now, it is remarkable that this law of dispersion, so unlike anything observed in transparent media, agrees pretty closely with the results obtained by Sir David Brewster in some of the metals. In all these bodies the refractive index (inferred from the angle of maximum polarization) *increases* with the length of the wave. Its values for the red, mean, and blue ray, in silver, are 3.866, 3.271, 2.824; the ratios of the second and third to the first being .85 and .73. According to the law above given, these ratios should be .88 and .79.

Professor Mac Cullagh made a verbal communication on the probable nature of the light transmitted by the diamond and by gold leaf. He conceives that as there is a change of phase caused by reflexion from these bodies, so there is also a change of phase produced by refraction; the change being different according as the incident light is polarized in the plane of incidence, or in the perpendicular plane. Consequently, if the incident ray be polarized in any intermediate plane, the refracted ray should be elliptically polarized; and on examining the light transmitted by gold leaf, this was found to be the case. Of course the same thing is true of the light which enters the other metals, and which is subsequently absorbed. The same remark explains the appearance of double refraction in specimens of the diamond which give only a single image; and it is likely that other precious stones will be found to possess similar properties. Mr. Mac Cullagh has obtained a general formula for the difference of phase between the two component portions of the refracted light—one polarized in the plane of incidence, and the other perpendicular to it. He finds from this formula, that the difference of phase, which is nothing at a perpendicular incidence, increases until it becomes equal to the *characteristic* at an incidence of 90°; and when the light emerges into air, the difference of phase is doubled. The formula has not yet been submitted to the test of experiment.

Mr. Mac Cullagh then read a paper "on the Laws of Crystalline Reflexion and Refraction."

In this paper the solution of the following problem is given for the first time:—

Supposing a ray of light, polarized in a given plane, to fall on a doubly refracting crystal, it is required to find the plane of polarization of the reflected ray, and the proportion between the amplitudes of vibration in the incident, the reflected, and the two refracted rays.

The constructions to which the author has been led by his theory are extremely simple, and may be explained most easily by referring to a paper which he has already published in the Transactions of the Academy, vol. xvii. pp. 251, 252. To avoid circumlocution, he uses the term *transversal,* to denote a right line parallel to the plane of polarization of a ray, and perpendicular to the direction of the ray itself. When the transversal is spoken of as a finite magnitude, its length is understood to be proportional to the amplitude of the vibrations in the polarized ray. Let O (as in the place just referred to) be the point of incidence on the crystal, and OT, OT′, the directions of the two refracted rays, the points T, T′, being on the wave-surface. Corresponding to the points T and T′ on the wave-surface, there are two other points, P and M, on a second surface which is reciprocal to the wave-surface. The points P and M are derived from the points T and T′ by an easy rule which is given in the place before cited. Now if we wish to find in what direction the incident ray must be polarized in order that the ray OT′ may disappear, let us draw, through the point O, a plane A perpendicular to the plane OTP, and parallel to the right line TP, which joins the corresponding points, T, P. This plane A will intersect the planes of the incident and reflected waves in two right lines, which will be the transversals of those waves; so that if the incident ray or wave be polarized parallel to the first intersection, the reflected ray will be polarized parallel to the second intersection, and there will be only a single refracted ray OT. A right line drawn through the point O, perpendicular to the plane OTP, will lie in the plane A, and will be the transversal of the refracted ray OT; and if, measuring from the point O, the lengths of the three transversals represent the amplitudes of the respective vibrations, the transversal of the refracted ray OT will be the diagonal of the parallelogram, whose sides are the transversals of the incident and reflected rays. The problem is, therefore, completely solved in this case; and it is obvious, that a construction precisely similar will apply to the other case, in which OT′ is the only refracted ray. The plane B, which, in this second case, answers to the plane A in the first case, is perpendicular to the plane OT′M, and parallel to the right line T′M.

If the incident ray be polarized in a direction intermediate between the two transversal directions which give only a single refracted ray, the incident vibration may be resolved into two vibrations parallel to those two transversals. The reflected vibrations arising from each of the component incident vibrations are to be found by the foregoing rules, and then to be compounded.

When the intersection of the planes A and B is perpendicular to the direction of the reflected ray, this ray is polarized parallel to that intersection, whatever be the plane of polarization of the incident ray. The angle of incidence at which this takes place is the polarizing angle.

When the refracted ray OT or OT′ is a normal to the wave-surface, the plane A or B is the plane of polarization of the ray. For example, if OT be the ordinary ray in a uniaxal crystal, the plane A contains the ray OT and the axis of the crystal.

The hypotheses from which Mr. Mac Cullagh has obtained the foregoing laws, are these:—

1. The density of the æther is the same in all media.
2. The vibrations are parallel to the plane of polarization.
3. The *vis viva* is preserved.
4. The vibrations are preserved: that is, the resultant of the incident and reflected vibrations is the same as the resultant of the refracted vibrations.

The author finds that his theory represents very accurately the experiments of Sir David Brewster and M. Seebeck, on the light reflected in air from a surface of Iceland spar.

DONATIONS.

A Description of the Shetland Islands, comprising an Account of their Geology, Scenery, Antiquities, and Superstitions. By Samuel Hibbert, M. D., F. R. S. E., &c. Presented by the Author.

Memoir on the Tings of Orkney and Shetland. By the same Author.

Observations on the Theories which have beeen proposed to explain the Vitrified Forts of Scotland. By the same Author.

Flora Batava, No. 108. By H. C. Van Hall. Presented by the Author.

The American Almanac and Repository of Useful Knowledge, for the Year 1837. Presented by the American Philosophical Society.

January 23.

RICHARD GRIFFITH, Esq. in the Chair.

Captain Portlock read a notice of the occurrence of Anatifa Vitrea,* of Lamarck, in several localities on the Irish coast. He commenced by enforcing the great importance of recording as quickly as possible the first discovery in a new locality of any species of the animal or vegetable kingdom, as tending to perfect the Fauna or Flora of the district in which it is found; and pointed out the value of such local Faunæ and Floræ in estimating the relations and mutual dependencies of co-existing animals and plants, and affording a basis of comparison by which future observers may be enabled to test the probability of new organic beings occa-

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* Lepas fascicularis, of Ellis, Montague, and other authors; Lepas dilata, of Donovan.